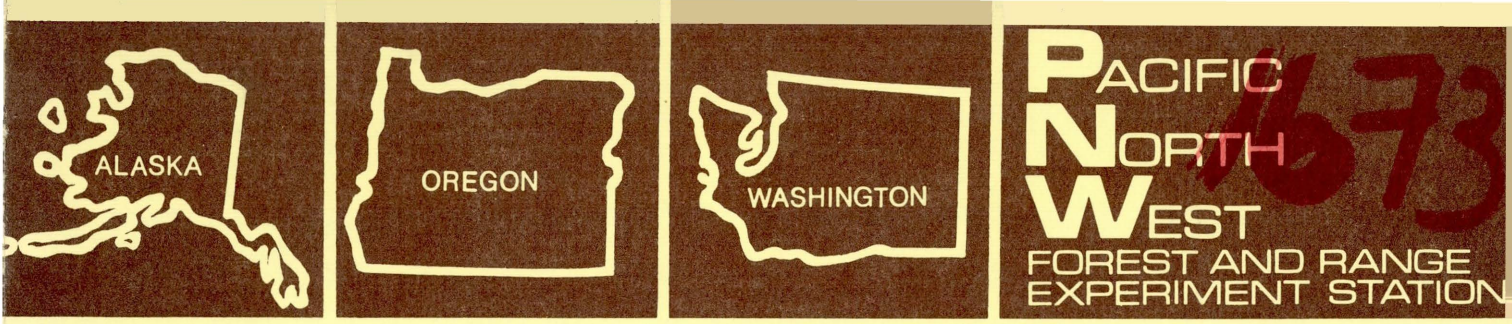


1673

USDA FOREST SERVICE RESEARCH NOTE

DAG
REG
DJC

PNW-242

April 1975

1673
R06
FHP

# ADDITIONAL RELEASES OF LARCH CASEBEARER PARASITES FOR BIOLOGICAL CONTROL IN THE WESTERN UNITED STATES

R. B. Ryan,[1] W. E. Bousfield,[2] R. E. Denton,[3]
R. L. Johnsey,[4] L. F. Pettinger,[5] and R. F. Schmitz[3]

## ABSTRACT

*Additional* Chrysocharis laricinellae[6] *and four new parasites,* Necremnus metalarus,[6] Elachertus argissa,[6] Dicladocerus "*A*",[6] *and* Diadegma laricinella,[7] *were released for biological control of the larch casebearer in Washington, Idaho, and Montana.*

*KEYWORDS:* *Biological control ( -forest pests, larch casebearer,* Coleophora laricella, Chrysocharis laricinellae, Necremnus metalarus, Elachertus argissa, Dicladocerus "*A*", Diadegma laricinella.

[1]Forestry Sciences Laboratory, Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, Corvallis, Oregon.

[2]Forest Environmental Protection, Region 1, USDA Forest Service, Missoula, Montana.

[3]Forestry Sciences Laboratory, Intermountain Forest and Range Experiment Station, USDA Forest Service, Moscow, Idaho.

[4]Washington State Department of Natural Resources, Olympia, Washington.

[5]Division of State and Private Forestry, Region 6, USDA Forest Service, Portland, Oregon.

[6]Hymenoptera: Eulophidae.

[7]Hymenoptera: Ichneumonidae.

DJC has xp

FOREST SERVICE - U.S. DEPARTMENT OF AGRICULTURE - PORTLAND, OREGON

## INTRODUCTION

The larch casebearer, *Coleophora laricella* (Hbn.), is a minor pest of larch in Europe. It was inadvertently introduced into eastern North America, where the subsequent defoliation of eastern larch (*Larix laricina* (Du Roi) Koch.) prompted a parasite introduction program in the 1930's (Dowden 1962, McGugan and Coppel 1962). Two of the five species released, the braconid, *Agathis pumila* (Ratz.), and the eulophid, *Chrysocharis laricinellae* (Ratz.), became established. Casebearer populations dropped considerably following the establishment of these parasites and have generally remained low enough to cause little or no concern, making it an example of successful biological control (Turnbull and Chant 1961, DeBach 1964).

Now that the casebearer has invaded western larch (*Larix occidentalis* Nutt.) stands in the Western United States, attempts are being made to extend biological control to this infestation. *A. pumila* was introduced in 1960 (Denton 1972), and *C. laricinellae* and *Dicladocerus westwoodii* Westw. were released in 1972 (Ryan and Denton 1973).[8] Additional releases of *C. laricinellae* from several sources were made in 1973 and 1974 and four new species were released in 1974. The purpose of this note is to record details of the sources of these populations, dates, and locations of these new releases.

## ACQUISITION AND IDENTITY OF RELEASED MATERIAL

All parasites originated from collections of *Coleophora laricella* (Hbn.) (Lepidoptera: Coleophoridae) in Europe or Wisconsin or *C. longisignella* Moriuti in Japan taken from larch (*Larix*), the species of larch depending on the locality. Parasites were identified by C. M. Yoshimoto, Canadian Forestry Service, Department of Environment, Ottawa, and B. D. Burkes[9] and R. W. Carlson, U.S. National Museum, Washington, D.C. Voucher specimens are available at the U.S. National Museum or the Beneficial Insect Research Laboratory, Newark, Delaware.

The *Chrysocharis laricinellae* material which was released originated from several different localities. At the time of their collection there was some uncertainty as to how many species of *Chrysocharis* parasitize the larch casebearer. Stock known as *C. novellus* (Jagsch 1973) was obtained from Austria; stock obtained from Sweden was known

---

[8]Both *C. laricinellae* and *D. westwoodii* are reported to be present in western larch stands. See Ryan et al. (1974) and Miller and Finlayson (1974).

[9]Retired.

as *C. nitetis* (Eidmann 1965). *C. laricinellae* was also obtained from England and from Wisconsin. In view of the taxonomic uncertainties, populations from the four source locations were considered different and were cultured and released separately. However, subsequent biosystematic study has since shown these to be conspecific (Ryan and Yoshimoto, in press).

Parasites from the Tyrolian and Styrian Alps of Austria and North Tirol of northern Italy were obtained from 1972 to 1974 through the cooperation of H. Pschorn-Walcher of the European Station, Commonwealth Institute of Biological Control, Delemont, Switzerland, and collectors Jagsch, Blumel, and Altenhofer. Collections in England in May of 1972 were made by personnel of the Forest Research Station, Farnham, at Staple Edge, Edgehill, and Crabtree Hill, all near Cinderford, Gloucestershire. H. Eidmann, Royal College of Forestry, Stockholm, and the Stockholm Biological Laboratory made collections in Uppland, Sweden, in March and April of 1973. Collections in northern Wisconsin in May and June of 1972 were made by H. C. Coppel and J. W. Mertins, University of Wisconsin, Madison. Collections in the Nagano and Gifu prefectures of central Honshu, Japan, were made in May and June of 1974 by N. Morimoto, Shinshu University, Ina, and K. Kanamitsu, Tokyo University, respectively.

Adult parasite shipments from abroad or infested material from which parasites subsequently emerged in quarantine were received at Belleville, Ontario, by J. S. Kelleher and G. D. Williamson, Agriculture Canada, Ottawa; or at Moorestown, New Jersey, or Newark, Delaware, by W. H. Day and L. R. Ertle, Beneficial Insect Research Laboratory, Newark, Delaware.

## LOCATION, TIMING, AND SIZE OF RELEASES

Details of the releases are presented in table 1. Releases were timed to coincide with the presence of susceptible host stages. *Diadegma laricinella* (Strobl) parasitizes needlemining larvae, whereas *C. laricinellae*, *Necremnus metalarus* (Walker), *Elachertus argissa* (Walker), and *Dicladocerus* "A" attack casebearing larvae. Although highly dependent upon elevation, casebearing larvae were actively feeding from late April until early June and again from mid-September through October.

Parasites were released on study plots on which data on host density and parasitization are being taken by the several agencies cooperating in the work. Thus, evaluation of the introductions will be available.

Table 1.--Releases of *Chrysocharis laricinellae*, *Necremnus metalarus*, *Elachertus argissa*, *Dicladocerus* "A," and *Diadegma laricinella* in Washington, Idaho, and Montana, 1973-74

| Liberation site | Date of release | Number released | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| *Chrysocharis laricinellae* (Ratz.) (Hymenoptera: Eulophidae) | | | | |
| Idaho[1] | | | | |
| U.S. Hwy. 95,25 mi N. Moscow 47°02' N. 116°52' W. | Apr. 25, 1973 | 192 | 433 | 625 |
| | May 2, 1973 | 75 | 136 | 211 |
| | May 5, 1973 | 62 | 111 | 173 |
| | May 16, 1973 | 127 | 203 | 330 |
| | May 30, 1973 | 160 | 220 | 380 |
| | Sept. 11, 1973 | 33 | 172 | 205 |
| | Oct. 5, 1973 | 140 | 67 | 207 |
| 4.6 mi N. Troy 46°47' N. 116°48' W. | May 4, 1974 | 263 | 244 | 507 |
| 5.6 mi N. Troy 46°48' N. 116°47' W. | May 16, 1974 | 151 | 154 | 305 |
| 6 mi N. Troy 46°48'N. 116°47' W. | May 22, 1974 | 147 | 159 | 306 |
| Lochsa River, Eagle Mountain Pack Bridge 62.2 mi E. Kooskia 46°26' N. 115°8' W. | May 30, 1974 | 147 | 154 | 301 |
| 3.4 mi E. Bovill 46°51' N. 116°20' W. | Sept. 27, 1974 | 33 | 276 | 309 |
| Montana[2] | | | | |
| 4 mi N. Evaro 47°05' N. 114°04' W. | May 2, 1973 | 283 | 403 | 686 |
| | May 11, 1973 | 81 | 116 | 197 |
| | May 18, 1973 | 122 | 134 | 256 |
| | May 23, 1973 | 93 | 102 | 195 |
| | May 16, 1974 | 196 | 219 | 415 |
| | May 31, 1974 | 80 | 92 | 172 |
| | June 7, 1974 | 63 | 123 | 186 |
| Washington | | | | |
| Colville Indian Reservation, E. Round Lake[3] 48°17' N. 118°18' W. | April 27, 1973 | 238 | 472 | 710 |
| | May 9, 1973 | 185 | 159 | 344 |
| | May 17, 1973 | 85 | 89 | 174 |
| | May 24, 1973 | 179 | 72 | 251 |
| | May 7, 1974 | 187 | 230 | 417 |
| | May 24, 1974 | 131 | 115 | 246 |
| | May 31, 1974 | 89 | 78 | 167 |
| | Sept. 26, 1974 | 1 | 112 | 113 |

See footnotes at end of table.

Table 1.--Releases of *Chrysocharis laricinellae*, *Necremnus metalarus*, *Elachertus argissa*, *Dicladocerus* "A," and *Diadegma laricinella* in Washington, Idaho, and Montana, 1973-74--continued

| Liberation site | Date of release | Number released | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| *Chrysocharis laricinellae* (Ratz.) (Hymenoptera: Eulophidae) (continued) | | | | |
| Charley Creek, 15 mi S. Pomeroy[4] 46°15' N. 117°30' W. | May 11, 1973 | 195 | 58 | 253 |
| | Sept. 25, 1973 | 119 | 81 | 200 |
| | Oct. 10, 1973 | 292 | 182 | 474 |
| | May 10, 1974 | 659 | 573 | 1,232 |
| | May 23, 1974 | 108 | 131 | 239 |
| | May 30, 1974 | 155 | 185 | 340 |
| | June 7, 1974 | 123 | 157 | 280 |
| | Sept. 20, 1974 | 122 | 192 | 314 |
| | Sept. 25, 1974 | 143 | 124 | 267 |
| *Necremnus metalarus* (Walk.) (Hymenoptera: Eulophidae)[1] | | | | |
| Idaho | | | | |
| 4.6 mi N. Troy 46°47' N. 116°48' W. | May 4, 1974 | 3 | 409 | 412 |
| 5.6 mi N. Troy 46°48' N. 116°47' W. | May 16, 1974 | 0 | 145 | 145 |
| 6 mi N. Troy 46°48' N. 116°47' W. | May 22, 1974 | 1 | 139 | 140 |
| Lochsa River, Eagle Mountain Pack Bridge 62.2 mi E. Kooskia 46°26' N. 115°8' W. | May 30, 1974 | 0 | 135 | 135 |
| 3.4 mi N. Bovill 46°51' N. 116°20' W. | Sept. 27, 1974 | 6 | 825 | 831 |
| | Oct. 9, 1974 | 5 | 386 | 391 |
| Montana | | | | |
| 4 mi N. Evaro 47°05' N. 114°04' W. | May 16, 1974 | 1 | 406 | 407 |
| | May 31, 1974 | 0 | 175 | 175 |
| | June 7, 1974 | 1 | 162 | 163 |
| | Sept. 24, 1974 | 1 | 275 | 275 |
| | Oct. 3, 1974 | 0 | 211 | 211 |
| Washington | | | | |
| Colville Indian Reservation, E. Round Lake 48°17' N. 118°18' W. | May 7, 1974 | 1 | 378 | 379 |
| | May 24, 1974 | 0 | 124 | 124 |
| | May 31, 1974 | 0 | 124 | 124 |
| | Sept. 26, 1974 | 0 | 357 | 357 |
| | Oct. 1, 1974 | 0 | 238 | 238 |

See footnotes at end of table.

Table 1.--Releases of *Chrysocharis laricinellae*, *Necremnus metalarus*, *Elachertus argissa*, *Dicladocerus* "A," and *Diadegma laricinella* in Washington, Idaho, and Montana, 1973-74--continued

| Liberation site | Date of release | Number released | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| *Necremnus metalarus* (Walk.) (Hymenoptera: Eulophidae)[1] (continued) | | | | |
| Charley Creek, 15 mi S. Pomeroy | May 10, 1974 | 1 | 445 | 446 |
| 46°15' N. 117°30' W. | May 23, 1974 | 1 | 139 | 140 |
| | May 30, 1974 | 0 | 95 | 95 |
| | June 7, 1974 | 0 | 92 | 92 |
| | Sept. 20, 1974 | 0 | 116 | 116 |
| | Sept. 25, 1974 | 0 | 173 | 173 |
| | Oct. 4, 1974 | 0 | 135 | 135 |
| *Elachertus argissa* (Walk.) (Hymenoptera: Eulophidae)[1] | | | | |
| Idaho | | | | |
| 3.4 mi E. Bovill | Sept. 27, 1974 | 10 | 141 | 151 |
| 46°51' N. 116°20' W. | Oct. 9, 1974 | 3 | 74 | 77 |
| | Oct. 18, 1974 | 12 | 51 | 63 |
| Montana | | | | |
| 4 mi N. Evaro | Sept. 24, 1974 | 7 | 105 | 112 |
| 47°05' N. 114°04' W. | | | | |
| Washington | | | | |
| Colville Indian Reservation, E. Round Lake | Sept. 26, 1974 | 7 | 102 | 109 |
| 48°17' N. 118°18' W. | | | | |
| Charley Creek, 15 mi S. Pomeroy | Sept. 20, 1974 | 8 | 81 | 89 |
| 46°15' N. 117°30' W. | Sept. 25, 1974 | 2 | 43 | 45 |
| | Oct. 4, 1974 | 1 | 31 | 32 |
| *Dicladocerus* "A" (Hymenoptera: Eulophidae)[5] | | | | |
| Idaho | | | | |
| 3.4 mi E. Bovill | Sept. 27, 1974 | 0 | 65 | 65 |
| 46°53' N. 116°20' W. | | | | |
| *Diadegma laricinella* (Strobl) (Hymenoptera: Ichneumonidae)[6] | | | | |
| Idaho | | | | |
| 4.6 mi N. Troy | July 23, 1974 | 0 | 10 | 10 |
| 46°47' N. 116°48' W. | | | | |

[1]Parasite strain originated in Austria-northern Italy.
[2]Parasite strain originated in England.
[3]Parasite strain recolonized from Wisconsin.
[4]Parasite strain originated in Sweden.
[5]Adults reared from material collected in Japan. The species is believed distinct from *Dicladocerus westwoodii* Westw. and *Dicladocerus* spp. already present (see Miller and Finlayson 1974).
[6]Adults reared from material collected in Austria-northern Italy.

## LITERATURE CITED


Denton, Robert E.
1972. Establishment of *Agathis pumila* (Ratz.) for control of larch casebearer, and notes on native parasitism and predation in Idaho. USDA For. Serv. Res. Note INT-164, 6 p. Intermt. For. & Range Exp. Stn., Ogden, Utah.

DeBach, Paul
1964. Successes, trends, and future possibilities. *In* P. DeBach (ed.), Biological control of insect pests and weeds, p. 673-713. Chapman and Hall, London.

Dowden, Philip B.
1962. Parasites and predators of forest insects liberated in the United States through 1960. U.S. Dep. Agric. Agric. Handb. 226, 70 p. Washington, D.C.

Eidmann, Hubertus H.
1965. Ökologische und physiologische Studien über die Lärchenminiermotte, *Coleophora laricella* Hbn. Stud. For. Suec. Nr. 32, 222 p.

Jagsch, Albert
1973. Populationsdynamik und Parasitenkomplex der Lärchenminiermotte, *Coleophora laricella* Hbn., im natürlichen Verbreitungsgebiet der Europäischen Lärche, *Larix decidua* Mill. Z. Angew. Entomol. 73: 1-42.

McGugan, B. M., and H. C. Coppel
1962. Biological control of forest insects--1910-1958. *In* A review of the biological control attempts against insects and weeds in Canada, Part II, p. 35-216. Tech. Commun. No. 2. Commonw. Inst. Biol. Control. Commonw. Agric. Bur., Farnham Royal, England.

Miller, G. E., and T. Finlayson
1974. Native parasites of the larch casebearer, *Coleophora laricella* (Lepidoptera: Coleophoridae), in the West Kootenay area of British Columbia. J. Entomol. Soc. B.C. 71: 14-21.

Ryan, R. B., W. E. Bousfield, G. E. Miller, and T. Finlayson
1974. Presence of *Chrysocharis laricinellae*, a parasite of the larch casebearer, in the Pacific Northwest. J. Econ. Entomol. 67: 805.

Ryan, R. B., and R. E. Denton
1973. Initial releases of *Chrysocharis laricinellae* and *Dicladocerus westwoodii* for biological control of the larch casebearer in the Western United States. USDA For. Serv. Res. Note PNW-200, 4 p. Pac. Northwest For. & Range Exp. Stn., Portland, Oreg.

Ryan, R. B., and C. M. Yoshimoto
(in press) Laboratory crossings with different sources of the larch casebearer parasite, *Chrysocharis laricinellae* (Ratz.) (Hymenoptera: Eulophidae). Can. Entomol.

Turnbull, A. L., and D. A. Chant
1961. The practice and theory of biological control of insects in Canada. Can. J. Zool. 39: 697-753.


GPO 993-295

The FOREST SERVICE of the U. S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.